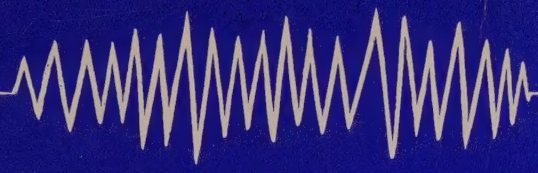

techni-rite

OPERATIONS AND SERVICE MANUAL
MODEL TR-711

SINGLE CHANNEL PORTABLE
HIGH SPEED RECORDER

6-A-19

operations and service manual

C6-S1-045

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ELECTRONICS
INCORPORATED

L-374A

OPERATIONS AND SERVICE MANUAL

MODEL TR-711

SINGLE CHANNEL PORTABLE
HIGH SPEED RECORDER

6-A-19

TECHNI-RITE ELECTRONICS, INC.
Techni-Rite Industrial Park
East Greenwich, R.I. 02818

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Figure 1-1 SINGLE CHANNEL RECORDER, MODEL TR-711

I. DESCRIPTION

A. General

The Techni-Rite Recorder, Model TR-711 is a portable single channel direct-writing analog recorder. It is capable of recording DC or AC signals in the range of DC to 125 Hz. The recorder is fully transistorized and has a self-contained calibration source. Writing is accomplished by means of a heated stylus traversing a heat and pressure sensitive chart paper. The recorder has provisions for six chart speeds of 1, 2, 10, 25 and 50 mm/sec.

B. Specifications

1.	RECORDER CONFIGURATION..	Portable, single channel
2.	FREQUENCY RESPONSE.....	DC to 125 Hz @ 8 div p-p 3db DC to 40 Hz 40 div p-p 1db
3.	RISE TIME.....	4 MS, 10 to 90% of full scale transition
4.	INPUT SENSITIVITY (CALIBRATED)*	
	Range 1.....	10mv/div, 200mv F.S.**
	Range 2.....	100mv/div, 2 volts F.S.
	Range 3.....	1 V/div, 20 volts F.S.
5.	INPUT IMPEDANCE.....	500K ohms, single ended, floating
6.	MAXIMUM INPUT VOLTAGE...	200 V peak signal to common or common to ground
7.	CALIBRATION.....	Internal; 1% accuracy
8.	WRITING METHOD.....	Pressure-thermal; true rectilinear coordinates
9.	LINEARITY.....	Within ±1% of full scale
10.	CHANNEL WIDTH.....	40 mm printed with 40 lines
11.	CHART SPEEDS.....	Six speeds in three ranges: Low - 1 & 2 mm/sec Med - 5 & 10 mm/sec High - 25 & 50 mm/sec
12.	TEMPERATURE RANGE.....	32 to 120°F
13.	DRIFT.....	Less than 0.3 chart divisions in 8 hours at constant temperature, 0.5 div/10°C maximum
14.	CONTROLS.....	Attenuator: Position: Sensitivity: Trace Width: Power/Chart Speed
15.	POWER REQUIRED.....	105-125V 60 Hz, 35 watts
16.	DIMENSIONS.....	12 1/2" x 4 1/4" x 4 1/4"
17.	WEIGHT.....	11 pounds

* Sensitivity can be varied via front panel control from approximately 10% above calibrated value to essentially zero.

**F.S. - Full Scale is defined as 20 chart divisions i.e., chart center to left or right chart margin.

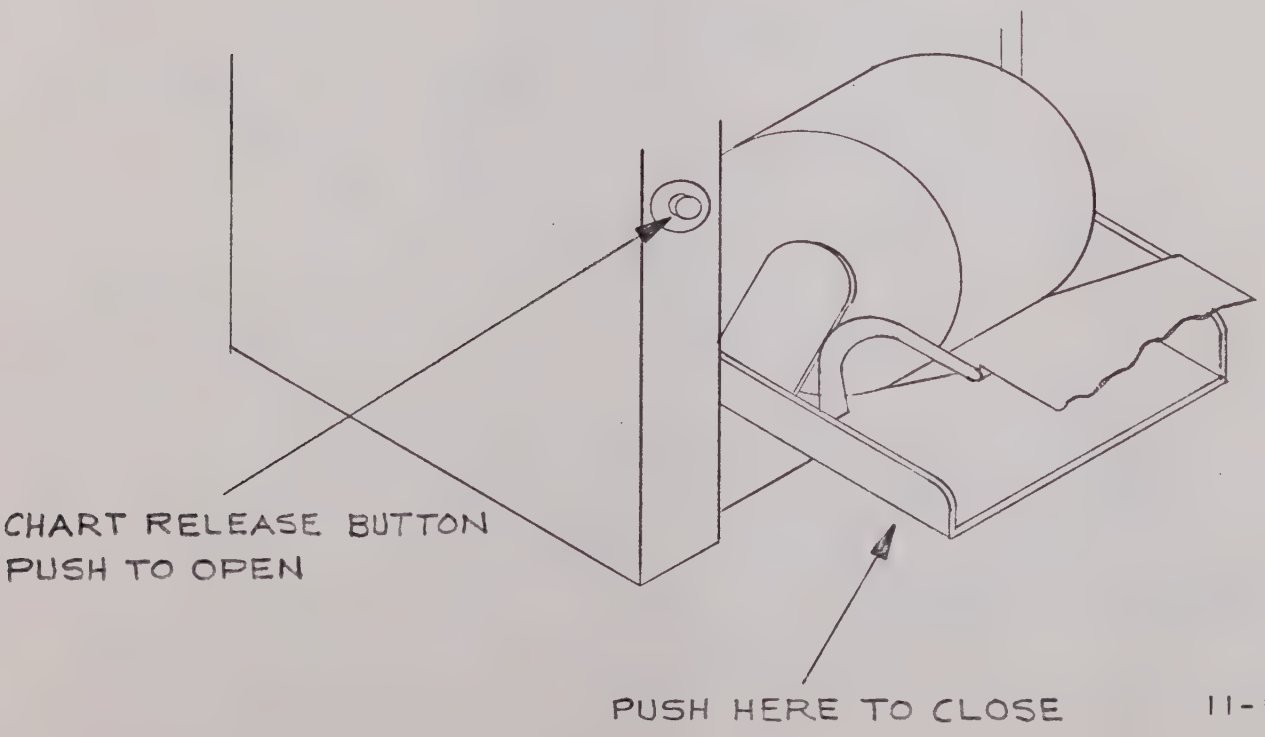
II. INSTALLATION

A. General

The TR-711 recorder is a portable instrument and is shipped in full operating condition. It is only necessary to plug the recorder into a source of 115V AC 60Hz power. NOTE: Do not defeat the purpose of the grounding pin of the TR-711's power plug. In certain situations, defeating the purpose of the line plug grounding pin may introduce "noise" (60Hz hum) into the recording system, as well as making the TR-711 a possible danger to life.

B. Chart Loading

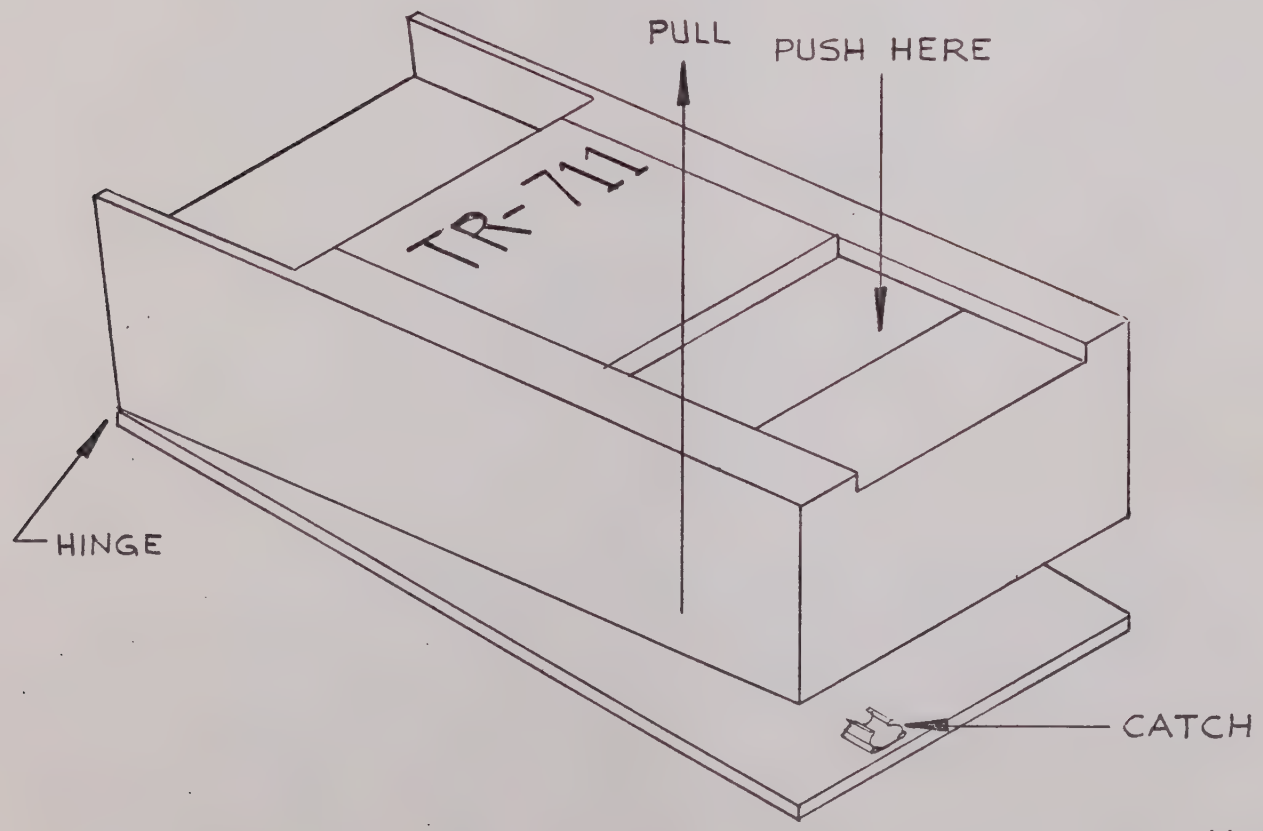
Open chart supply magazine by depressing the magazine release button. Remove and discard fiberboard core of expended chart roll and snap in a new roll as shown. Swing the chart magazine closed, pressing firmly to ensure that it latches properly.



C. Opening the Case

It will be necessary to open the case to change the Speed Range of the recorder, set stylus pressure, and for all maintenance functions.

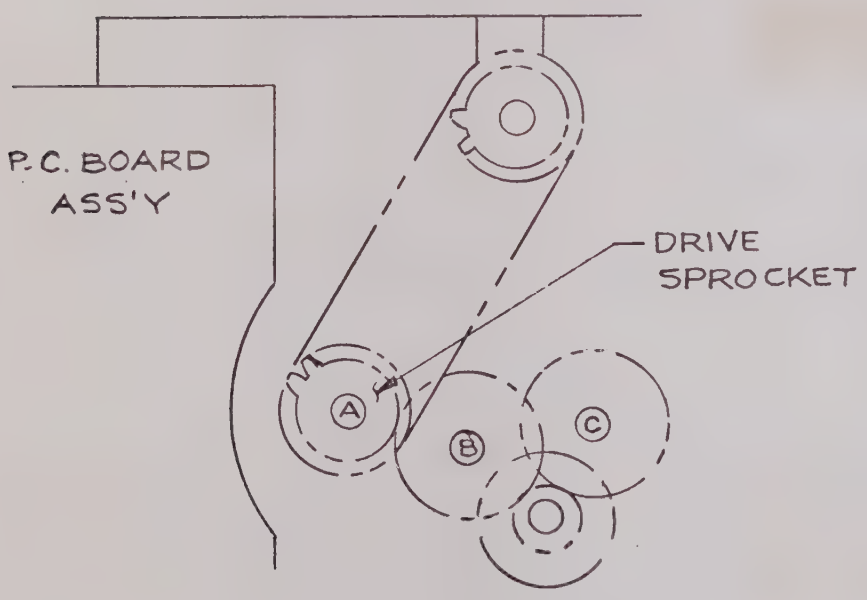
1. Place the end opposite the Control Panel toward you with the recorder flat on the table or work bench.
2. With the palms, grasp both sides of the recorder case with the finger tips curled slightly around the bottom edge of the case.
3. With the thumbs, press firmly on the top plate of the chart magazine.
4. The TR-711 case is hinged at the rear and held together at the front by means of a strong latch. Following steps 1 and 3 above will cause the two halves of the case to snap apart and the case will swing open.
5. To close case, simply push the case halves firmly together.



D. Selecting the Proper Speed Range

The TR-711 is equipped with a 3-speed transmission driven by a 2-speed drive motor to give a total of 6 chart speeds. The desired speed range is set by moving and fastening the transmission drive sprocket to the appropriate transmission output shaft. The recorder is shipped with the drive sprocket on shaft A for chart speeds of 25 - 50 mm/sec. Refer to the table for sprocket placement for the two lower speed ranges.

SPEED RANGE mm/sec		FASTEN DRIVE SPROCKET TO SHAFT MARKED
LOW	HIGH	
1	2	C
5	10	B
25	50	A



In general, the proper chart speed may be determined by the following "rule of thumb". Most applications of the recorder involve the recording of a voltage or a current which is varying at a certain maximum rate, or frequency. Simply choose the speed, in mm/sec, which approaches 1/2 the signal frequency, in cycles per second, e.g., a signal varying at 50Hz requires a speed of 25 mm/sec.

III. OPERATION

All necessary recorder controls are located on the recorder control panel. The following is a description of each control, followed by a section describing the proper sequence of operation.

A. CONTROLS

1. POSITION CONTROL

The purpose of the POSITION control is to "zero" the stylus on the chart. The range of the POSITION control is such that the stylus may be positioned over the whole width of the chart. Generally speaking, the "zero" line of the trace is set on the center line of the chart if an AC signal is to be recorded, and to one side or the other of the chart if a positive-only or negative-only signal is to be recorded. The POSITION control is also useful to enable recording of a small AC signal which is super-imposed upon a large DC signal, using the POSITION control to move the signal "on scale". This is a locking control.

2. TRACE WIDTH CONTROL

This control provides sufficient stylus heat to produce a black line of the optimum width at all signal frequencies. Adjust the TRACE WIDTH for minimum trace width consistent with good readability. Note that TRACE WIDTH control will not compensate for improper stylus pressure which is factory set at 2 1/2 $\pm$ 1/2 grams.

3. RANGE

The RANGE switch serves several purposes. In the OFF position, all external signals are disconnected from the amplifier. This eases set-up of the POSITION control. In the CAL position a factory preset calibration signal is fed into the recording amplifier. The three remaining positions of the

RANGE switch are for sensitivity selection.

4. SENSITIVITY CONTROL

   The SENSITIVITY control sets the gain of the TR-711 recording system. It is a locking-type control and is normally used only during calibration of the TR-711.

5. POWER CONTROL

   The POWER switch has four positions: OFF, ON, LOW and HIGH. In the OFF position, all power is off. In the ON position, the power is applied to the recorder electronics and pen motor but not to the drive motor. In the LOW position, the chart drive runs at the low speed, e.g., 25mm/sec in the 25, 50mm/sec speed range. In the HIGH position, the chart drive motor runs at high speed, e.g., 50mm/sec in the 25, 50mm/sec speed range.

B. CALIBRATION AND OPERATION

1. Attach the Power Cable to the appropriate socket on the recorder. Plug the Power Cable into a line source of 115 VAC, 60Hz (standard "house current").
2. Load Recorder with Chart Paper.
3. Set the Range Switch to OFF. Turn Power Control switch to the LOW position.
4. Unlock POSITION control by turning knurled knob 1/2 turn CCW. Use POSITION control to set Stylus to chart center line. Adjust Trace Width control for narrowest trace line consistent with good readability. Lock POSITION control.

5. Turn Range Switch from OFF to CAL position. Unlock SENSITIVITY control and adjust so that Stylus deflects 20 divisions from the channel center line. Slightly tighten SENSITIVITY control locking knob and switch Range Switch back to OFF to verify "zero" position of Stylus. Repeat if necessary to assure exactly 20 divisions stylus deflection from channel center line when Range Switch is turned from OFF to CAL position.
6. The Recorder is now a calibrated, recording Voltmeter with 3 sensitivity positions ranging from 10 millivolts per chart division to 2 volts per chart division. (Intermediate ranges may be obtained by adjusting the SENSITIVITY control as desired but with the loss of internal calibration.)
7. Connect the signal to be recorded to the input jacks of the recorder as follows:
   First, determine if source is isolated above ground, e.g., a balanced output, the collector load resistor of a transistor, or if source is referenced directly to ground, e.g., resistor load of an emitter-follower or cathode-follower output stage, a simple "battery" source with one end connected to ground, etc.
   For a balanced output signal source or one which is isolated above ground, connect the signal leads to the SIGNAL and COMMON input terminals. Make no connection to the GROUND input terminal. For a signal source referenced directly to ground, connect the signal leads to the SIGNAL and COMMON input terminals; connect the COMMON and GROUND input terminals together by means of a short jumper wire.
8. With Signal applied, advance Range Switch until the Stylus is deflected over the maximum practicable chart width. If the stylus deflects only to the right or to the left of chart center, the stylus may be repositioned

by means of the POSITION control. The POSITION control has no effect upon the linearity or sensitivity of the system.

9. Set CHART SPEEDS switch to the desired chart speed and trim TRACE WIDTH controls for minimum Trace Width consistent with good readability.

10. Noise on the recorded trace: Due to the high input impedance and sensitivity of the Recorder, noise will occur in the Recorded Trace under the following conditions:
    a) Recorder Range Switch set for high sensitivity and no signal applied.
    b) Recorder connected to signal which is referenced to GROUND, and COMMON and GROUND input terminals not connected together by jumper wire.
    c) Recorder connected to balanced output or isolated above-ground signal whose source impedance is greater than 5K ohms.
    d) Wires from signal to Recorder are of considerable length and not shielded or twisted together.
    e) Power Line grounding pin has been opened or Power Line ground is improper; Recorder must be properly grounded for proper and safe operation.

IV. PRINCIPLES OF OPERATION

The recorder is made up of two basic sub-systems, the first of which is the drive motor and Chart Drive Assembly, and the second is the signal conditioner Power Supply and Pen Motor/Amplifier.

A. Recorder Chart Drive: Ref: Schematic 401149.
The electrical operation of the Motor and Chart Drive Switch is straight-forward; Chart Drive Switch S2, decks B1 and B2 control the speed of the chart drive motor. Deck A1 applies power to the drive motor, transformer and to one of the rewind jacks. Deck A2 applies power to the other rewind jack.

B. Electronics System: Ref: Schematics 401149 & 401097.
The system consists of an Input Attenuator, (S1) a Signal Conditioner/Power Supply P.C. Board (PN 201123), Power Transformer (PN 104489) and a Model TM15-TA10 Pen Motor Driver Amplifier Assembly.

C. Input Attenuator:
The Input Attenuator provides a constant input impedance of 500K ohms (the sum of resistors R1 through R3). The Attenuator Slider selects the desired System Sensitivity by means of reducing the signal input to the Signal Conditioner by a ratio of 100, 10. and 1 for the three sensitivities of 20, 2, .2 volts F.S. When the Attenuator is in the CAL position, a precisely set Calibration signal of 200 millivolts, corresponding to a 20 division deflection of the stylus is applied to the Signal Conditioner input for Calibration of the System.

D. Signal Conditioner: Ref: Schematic 401097
The Signal Conditioner Card performs three functions. It serves as a Power Supply, Calibration Source, and overload-protected impedance converter.

1. Input Stage.

The Input Stage consists of a cascaded 2-stage emitter follower, Q1, whose input is protected by a clamp circuit consisting of R1 and back-to-back zener diodes CR2 and CR3 (selected for low leakage current). All input signals in excess of approximately 8.0 volts are dropped across R1. The input impedance of this stage is in excess of 30 megohms, and is typically 45 megohms, for minimum loading of the Input Attenuator. The voltage gain of this stage is unity.

Potentiometer R9, the "Vo" control, adjusts Q1 bias such that for zero signal in (input shorted), there will be zero signal out.

2. Power Supply.

The major components of the power supply are CR4, C1, C2, Q2 and Q3. It is a dual series regulator type, and supplies plus and minus 15 VDC power to the Input Stage, the Calibration Voltage stage, and the Pen Motor/Amplifier. The power supply is capable of supplying 325 ma, the normal peak current required by the system is 265 ma.

3. Calibration Voltage Circuit.

Reference Zener CR1 is supplied current by resistor R4, which is connected to the +15 volt power supply. Resistors R3, R6 and potentiometer R8 form a voltage divider to reduce the calibration voltage from the nine volt level of CR1 to the 200 millivolt level required by the system. R8 allows adjustment over a narrow range for precise calibration.

E. Controls: Ref: Schematic 401149.

1. Sensitivity Control.

The Sensitivity Control is used as the load for the input stage, referenced to signal common. The wiper of the Gain Control can be set to feed from zero to 100% of the output of the pre amp to the input of the driver amplifier located within the pen motor housing.

Since the sensitivity of the driver amplifier is on the order of 8 to 9 millivolts per chart division, this control is normally set between 80% and 90% of full rotation to yield the calibrated sensitivity of 10 millivolts per chart division.

2. Position Control-(R3).
This control is connected from the positive power supply line to the negative power supply line, and its wiper may therefore be set to provide from -15 VDC to +15 VDC to the Position Voltage input of the Integrated Amplifier/Pen Motor.

F. Amplifier/Pen Motor Assembly.
This is a sealed assembly consisting of a Techni-Rite D'Arsonval type Pen Motor with two windings, a Drive winding similar to that found in a standard meter, and a Velocity Feedback winding which is used to obtain smooth frequency response and to control the percentage of overshoot in response to a step input signal.
A small driver amplifier is sealed into the bottom cap of the pen motor. It is potted after assembly and is not repairable or replaceable in the field. It is basically a differential amplifier with a complementary output stage with power output capability of approximately 5 watts. It accepts the signal to be recorded into its non-inverting input and feedback and position signals into its inverting input. Its output drives the Pen Motor directly. The Amplifier/Pen Motor Assembly has only one control, which is mounted on the top cap. It is the damping control, which adjusts the amount of signal fed to the inverting input of the driver amplifier from the Pen Motor Velocity coil.

V. STYLUS MAINTENANCE & REPLACEMENT

A. Stylus Inspection

After extended use, plastic chart coating may build up on the writing element causing uneven writing. Carefully scrape writing element clean with a razor blade.

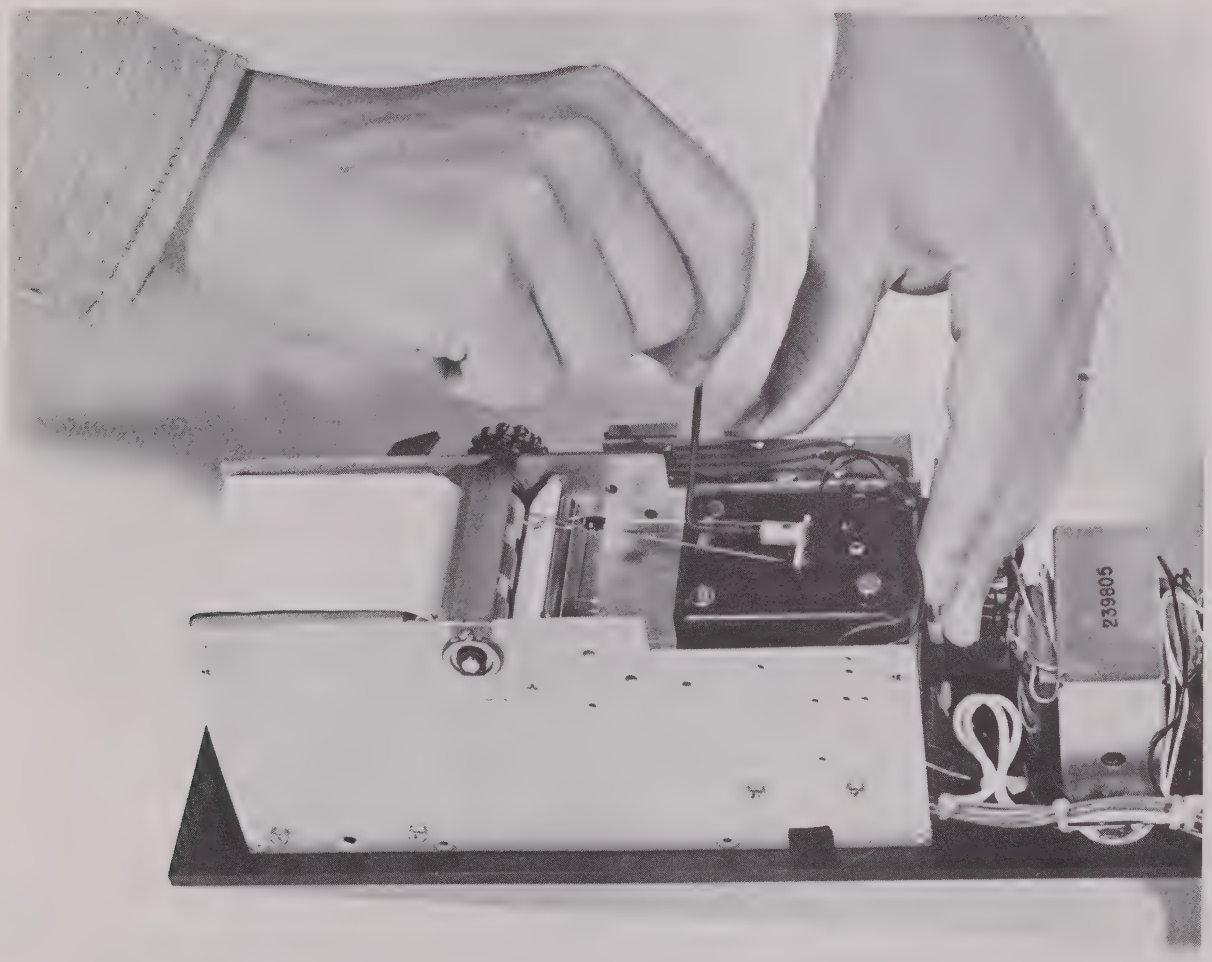
B. Stylus Pressure

Stylus pressure is an aspect of the TR-711 which must not be ignored. Using a stylus gage, hook the stylus gage under the writing element of the stylus and lift directly away at right angle to the stylus. (Be sure stylus is not stuck to chart). Read stylus gage just as writing element lifts away from the chart. STYLUS PRESSURE SHOULD BE 2 to 4 grams. If stylus pressure is too low, improper writing at high speeds will result. If pressure is too high, recorder rise time (response) and stylus life will suffer. Correct improper stylus pressure by bending the rear quarter of the stylus struts carefully, or by sliding the stylus up or down on the pen motor shaft.

C. Stylus Replacement

1. When the stylus ceases to operate due to a broken or bent writing element, it must be replaced. Leave loaded chart in recorder.
2. Open recorder case. Lift the case up and back on its rear-mounted hinges.
3. Locate stylus, stylus power plug and stylus clamping screw (on aluminum stylus body).
4. Unplug stylus power plug from top cap of pen motor. Loosen stylus clamping screw. Remove and discard stylus.
5. Install new stylus. With recorder POWER OFF, position the new stylus within one chart line of the center line of its channel and clamp the stylus securely into place.

6. Plug stylus plug into the pen motor mounted power socket.
7. Check and adjust stylus pressure.



VI. PERFORMANCE/CALIBRATION CHECK AND ALIGNMENT PROCEDURE

Periodically the recorder should be tested and the necessary adjustments made to assure it meets its specified accuracy.

Test Equipment Required:

Function Generator, Wavetek Model 110 or equal
Digital Voltmeter, Fluke 8100 or equal
X-celite Model P-4, 1/8" hex nut driver
Thin bladed screw driver with 6" shank
Phillips screwdriver, 5/32" Allen key

A. Open the recorder case and swing the case top up and back, exposing the inside of the recorder. (CAUTION: when power is applied, exposed voltage is present in the area of the transformer and power switches).

B. Inspect Stylus: Discard if heater element is bent, broken, or flattened. Install new Stylus, if required, according to the instructions on Stylus Replacement.

C. Carefully set Stylus Pressure to between 2 and 4 grams, favoring 2 grams when slower signals are to be recorded, and 4 grams when faster signals are present.

D. Apply power to the recorder and allow 15 to 20 minutes warm-up time.

E. Set VO: Set the Range Control to the OFF position. Connect the DVM input between TP2 and TP4 on the pre-amp PCB assembly. Set the DVM to its highest sensitivity and adjust the VO control located on the PCB assembly until the DVM reads zero $\pm$1 millivolt.

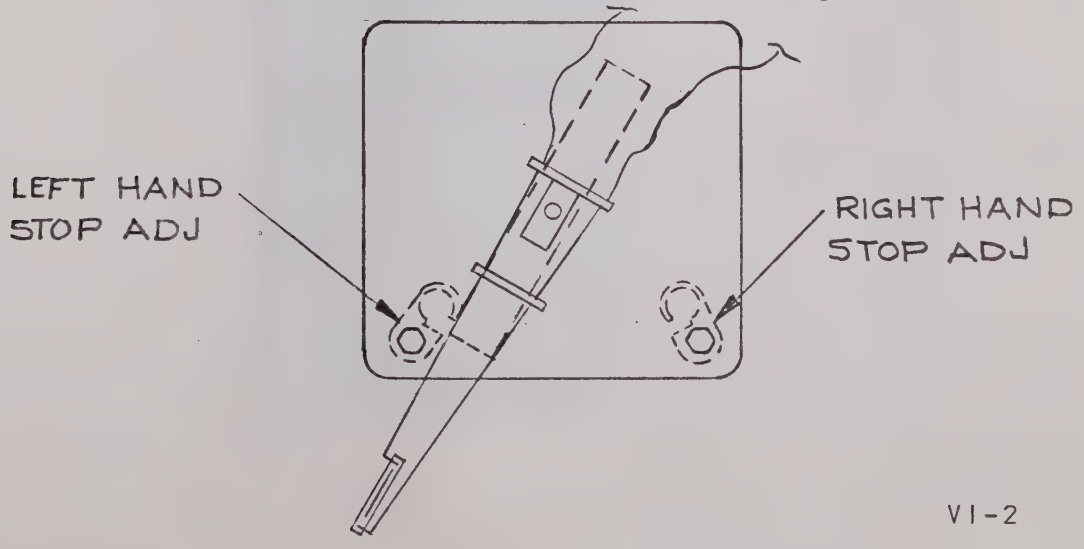
F. Internal Calibration Voltage Adjustment: Set the Range Control to the CAL position. Connect the DVM between TP1 and TP4 on the PCB assembly and adjust the CAL control for a DVM reading of 200 $\pm$ 2 millivolts.

G. Linearity Check: Load chart paper and connect a Function Generator to the recorder input. Set Generator for a .5Hz triangular wave and adjust the recorder sensitivity and po-

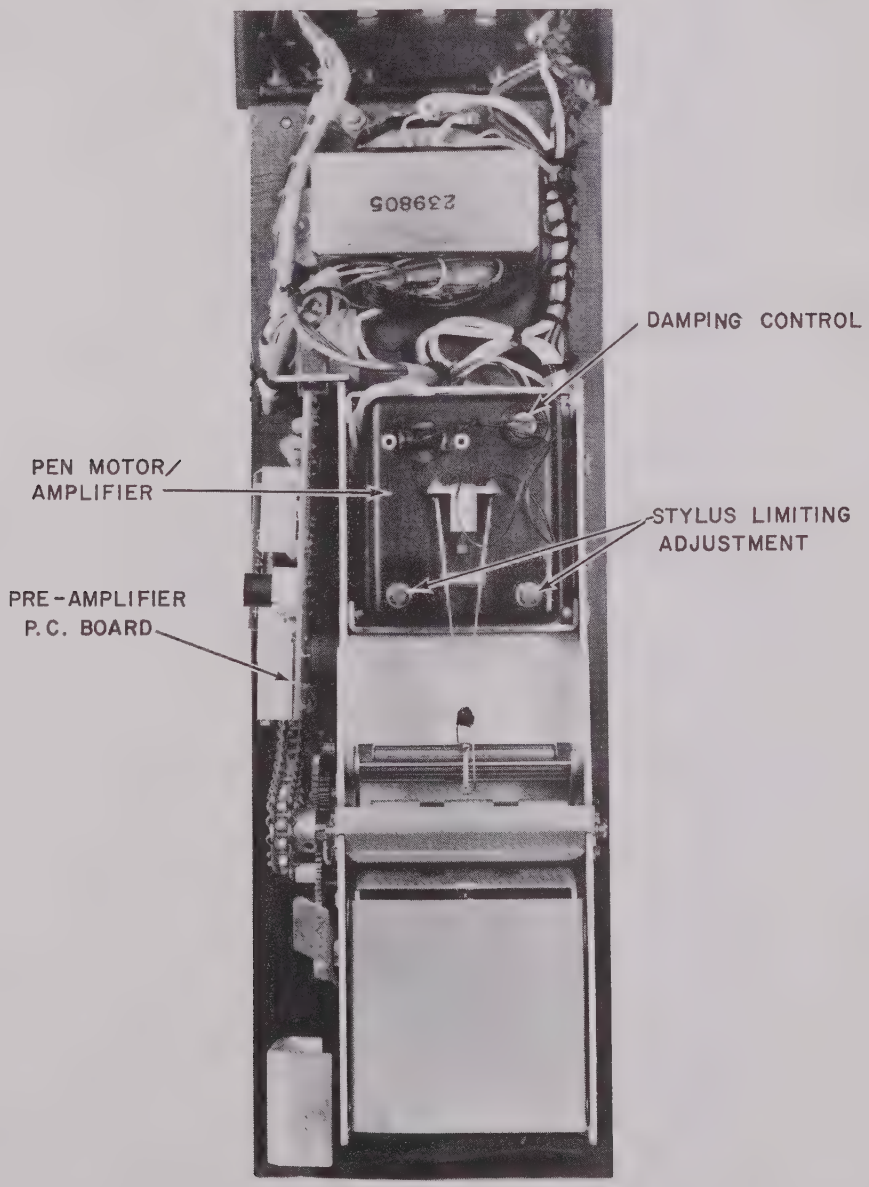
sition controls such that the wave form is recorded across the full sidth of the chart. Run off 5 to 6 feet of chart paper at a 25mm/sec chart speed. Lay a ruler (straight edge) along the recorded trace and adjust for best fit. The trace should not vary by more than ±1/2 chart division from a straight line.

H. Square Wave Response: Insert a 1 Hz square wave at the input to the recorder. Set position and sensitivity controls for a 30 chart division peak-to-peak recorded waveform symetrical about chart center. There should be between 1/2 and 1 division of overshoot on the recorded trace. If this condition is not met, carefully adjust the Damping control on the right rear corner of the pen motor cover with a fine bladed screw driver.

I. Stylus stop adjustment: The stylus travel stops are set to limit stylus excursion to approximately 2mm beyond full scale on right and left. To check setting, turn position control first fully CCW and then fully CW. If excursion is out of spec, adjust the stylus stops located on the top cover of the pen motor using an X-celite 1/8" nut driver. Refer to figure shown below.



J. Lubrication: Every six months inspect the drive chain and lightly oil it with a mixture of SA-10 oil and molycote powder (Alpha Molycote Corp.).



VII. PARTS LIST

RECORDER ASSEMBLY

Ref. Des.	Dwg. 600780 Description	Techni-Rite Part Number	Units Per A'ssy
1	Case Assembly	500426	1
3	Knob,3/4 skirt,1/4 hole	103575	1
4	Knob,3/4 skirt,1/8 hole	103574	1
5	Knob,1 1/8 skirt,1/4 hole	104347	1
6 E1	Terminal Post - red	100441-2	1
7 E2	Terminal Post - blk	100441-0	1
8 E3	Terminal Post - gray	100441-8	1
11	Actuator Button	102355	1
14	Handle	201885-1	1
15	Roll Pin 3/32		1
17	Knob	102023	2
18	Shaft Lock	102590	2
20	Spacer Post	104930	1
21	Shield, Attenuator	A-104987	1
22	Rubber Bumper	102170	4
23 R3,R4	Potentiometer, 50K	102008	2
24 S2	Rotary Switch	103452	1
25 R5	Pot 12.5W 1Ω	100745	1
26	Base Plate	401150	1
28	Power Cable	102368	1
29 P1	Power Connector, Male	102406	1
33	Panel	A-202013	1
35 HR1	Stylus SA-40	200006	1
36	Guide Bushing	1-103956-4	1
37 T1	Transformer	104025	1
38	Fuse Holder	100399	1
39 F1	Fuse	102200-1A	1
41 S1	Switch, Rotary	104689	1
42 R1	Resistor 453K, 1/4W, 1%	100549-4533	1
43 R2	Resistor 45.3K, 1/4W,1%	100549-4532	1
44 R3	Resistor 4.99K, 1/4W,1%	100549-4991	1
45	PC Assembly	201123	1
46 J1	PC Connector	102224	1
48	Name Plate	100323	1
49	Grip Ring 5/32	100182	1
50	Recorder, Drive Ass'y	600535	1
51	Button, Chrome	101841	1
54	Bracket - Connector	104686	1
56	Jack, Banana	104327	2
58	Grommet, Rubber	104990	1
59	Clip, Spring Tension	106905	1
60	Plate, mtg	201884	1
61	Stop	106807	1
62	Bracket, Fuse holder	201928	1

VII. PARTS LIST

DRIVE ASSEMBLY

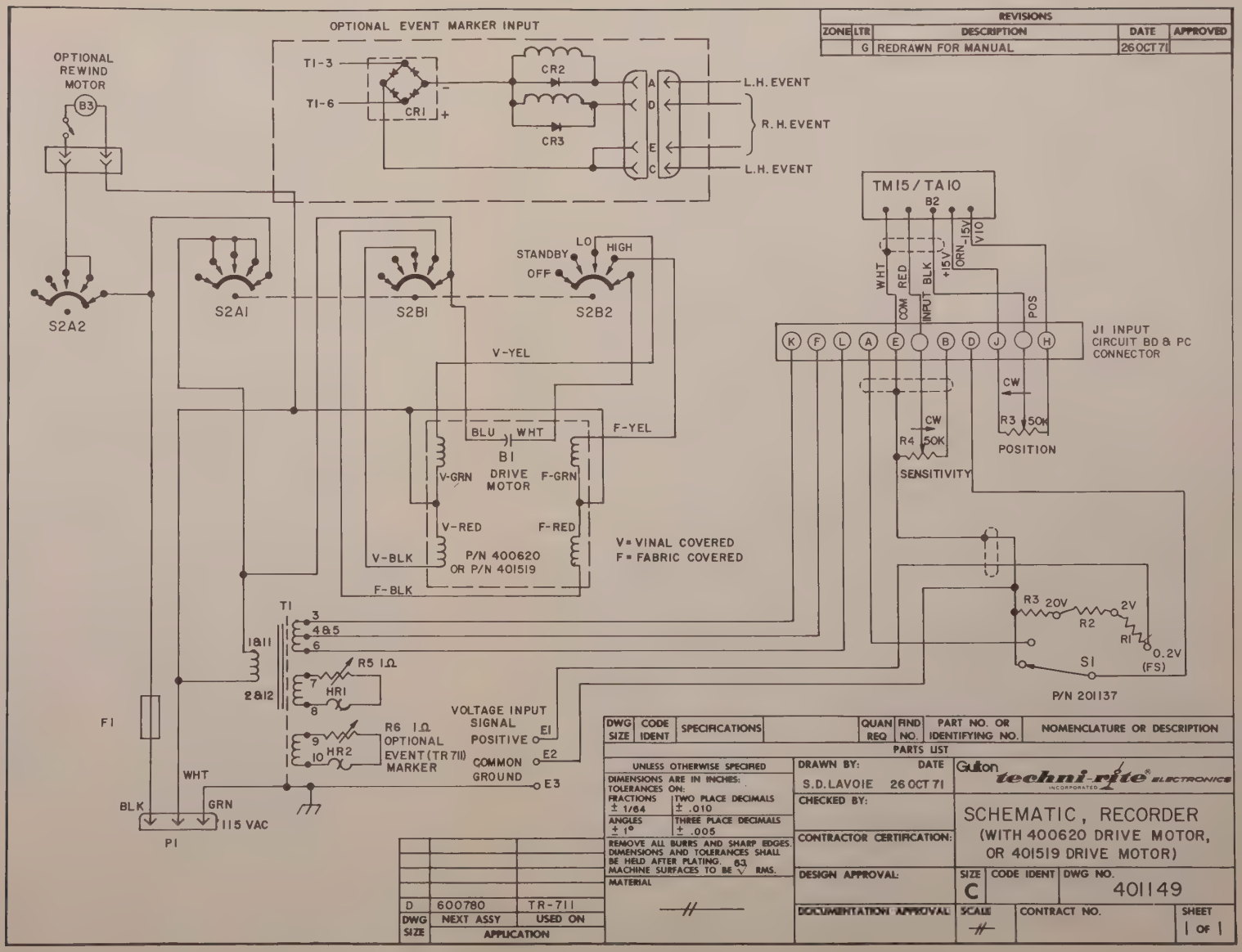
Ref. Des.	Dwg. 600535 Description	Techni-Rite Part Number	Units Per Ass'y
3	Drive Motor Cover	102749	1
5	Paper cut-off	1-102763	1
6	Writing Table	3-102734	1
7	Chart Load Bracket	105001	1
8	Chart Hold Bracket	102760	1
9	Pressure Bracket	102747	1
10	Chart Spring	102759	1
11	Gear Train Assembly	500095	1
12	Standoff	101017	2
15	Writing Table Shaft	102745	1
16	Writing Table Torsion Spring	102746	1
17	Writing & Chart Shaft	102735	1
18	Idler Shaft Torsion Spring	102732	2
19	Chart Load Bracket Torsion Spring	103064	1
21	Chart Load Bracket Guide	102757	2
22	Knurled Drive Roll	102580-2	1
23	Knurled Roll Ball Brng.	104227	2
24	Pressure Frame	102758	1
25	Pressure Frame Torsion Spring	102750	1
26	Pressure Shaft	102744	1
27	Pressure Frame Shaft	102743	1
29	Butt Terminal	102731	1
30	Pen Motor Shim	102752	2
31	Pen Motor Bracket	102738	2
32	Writing Table Spacer	101724	2
33	Stop Bar	102427	1
34	Stylus SA-40	200006	1
35	Drive Motor	401519-1	1
37	Sprocket-12 T-Drive Roll	101572	1
38	Sprocket-11 T-Drive Motor	1-102331	1
39	Ladder Chain	100347	1
41	Drive Screw #00 x 1/8	100391	4
43	Capacitor, Motor	401519-C	1
45	Spacer, Bracket	103925-1	1
46	Release lever Assembly	102463	1
47	Torsion Spring	102464	1
48	Serial No. Plate	103091	1
53	Chart Hold Bracket Shaft	103054	1
54	Lock-Tite	103056	X
55	Lever Bushing	103247	1
58	Spacer	102753	4
59	#4-40 Dynalock(Steel Cad.Plated)		1
60	Side Plate, R.H.	1-200902	1
61	Side Plate, L.H.	2-200902	1
67	Spacer Bracket	103925-2	2
68	Spacer Bracket	103925-3	3
73	Pen Motor	600627-TM15/TA10	1
74	Washer	1-100796	1

BUFFER AMP AND POWER SUPPLY ASSEMBLY

Find # Ref.Dwg. 201123	Ref. Des.	Description	Mfr.	Mfr. Part No.	Techni-Rite Part Number
1	R1	Resistor 100K-1/2WMF	Ward-L	RN650D	100550-1003
2	R9	Pot 20K	Beckman	77PR	103954-203
3	R7	Resistor 1M 1/4WMF	A&B	RN60D	100549-1004
4	R5	Resistor 49.9K 1/4WMF	A&B	RN60D	100549-4992
5	R4	Resistor 698Ω 1/4WMF	A&B	RN60D	100549-698R
6	R3	Resistor 51.1K 1/4WMF	A&B	RN60D	100549-5112
7	R6	Resistor 1K 1/4WMF	A&B	RN60D	100549-1001
8	R8	Pot 500Ω	Beckman	77PR	103954-501
10	R10,11	Resistor 180 1WCC	A&B	RC32	100558-181
11	C1,C2	Capacitor 530UF25V	IEC		104131
12	CR2,3	Diode Zener 7.5V			104679
13	CR1	Diode Zener 9V ref	Mot	1N935	104154
14	CR6	Rectifier Bridge	Mot	MDA920A	106080-2
15	CR5,4	Diode Zener 16V			101968-16
16	Q1	Transistor Dual	Sprague	TD601	104468
17	Q3	Transistor NPN	Mot	2N4922	103833
18	Q2	Transistor PNP	Mot	2N4919	103486
19	X	Heat Sink			104613-1
20	X	#4-40 BHMS SS 3/8LG			
21	PC-1	PC Board			104793
23		Spacer, Transistor			104305
24		Cup Washer (supplied with power transistor)			
25		Washer, Nylon			104706

VIII. SCHEMATICS AND DRAWINGS

Title	TRE Dwg. No.
Schematic, Recorder	401149
Schematic, Pre Amplifier	401097
Assembly, Single Channel Recorder	600780
Assembly, Recorder	600535 SH.2
Assembly, Pre Amplifier	201123



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	G	REDRAWN FOR MANUAL	26 OCT 71	

DWG SIZE	CODE IDENT	SPECIFICATIONS	QUAN REQ	FIND NO.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION

PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS ± 1/64 | TWO PLACE DECIMALS ± .010
ANGLES ± 1° | THREE PLACE DECIMALS ± .005
REMOVE ALL BURRS AND SHARP EDGES
DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING
63 MACHINE SURFACES TO BE √ RMS.
MATERIAL

DRAWN BY: S.D.LAVOIE DATE 26 OCT 71
CHECKED BY:
CONTRACTOR CERTIFICATION:
DESIGN APPROVAL:
DOCUMENTATION APPROVAL:

Gulton technirite® ELECTRONICS INCORPORATED

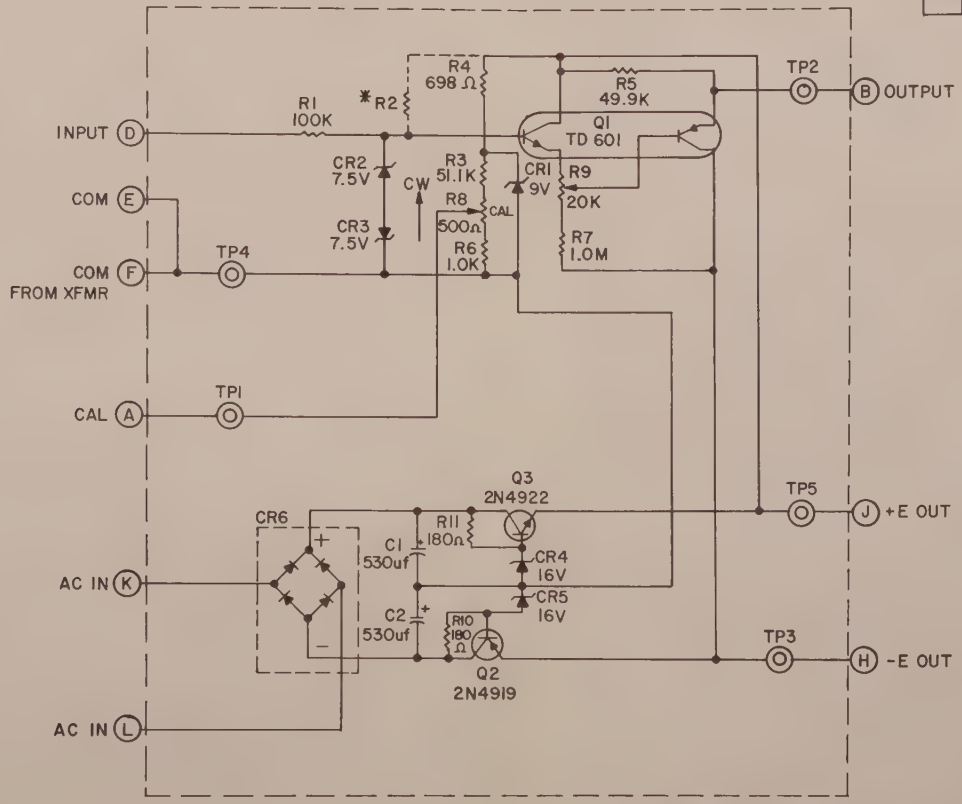
SCHEMATIC, RECORDER
(WITH 400620 DRIVE MOTOR, OR 401519 DRIVE MOTOR)

SIZE	CODE IDENT	DWG NO.
C		401149

SCALE	CONTRACT NO.	SHEET
#		1 OF 1

DWG SIZE	NEXT ASSY	USED ON
D	600780	TR-711
	APPLICATION	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	D	REDRAWN	10/20/71	H.J. Maguire



Io SHIFT	R2 (101880-X)
2 TO 4MV	600 MEG
4 TO 6MV	300 MEG
6 TO 8MV	250 MEG
8 TO 10MV	200 MEG
10 TO 12MV	180 MEG

* R2 SHALL BE SELECTED AT TEST TO REDUCE EXCESSIVE Io

DWG SIZE	CODE IDENT	SPECIFICATIONS	QUAN REQ	FIND NO.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
PARTS LIST						

B	201123	TR-711
DWG SIZE	NEXT ASSY	USED ON
	APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS ± 1/64 | TWO PLACE DECIMALS ± .010
ANGLES ± 1° | THREE PLACE DECIMALS ± .005
REMOVE ALL BURRS AND SHARP EDGES. DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING. 63 MACHINE SURFACES TO BE √ RMS.
MATERIAL —//—

DRAWN BY: S.D.LAVOIE DATE 20 OCT 71
CHECKED BY: Harold J. Maguire 10/20/71
CONTRACTOR CERTIFICATION:
DESIGN APPROVAL:
DOCUMENTATION APPROVAL:

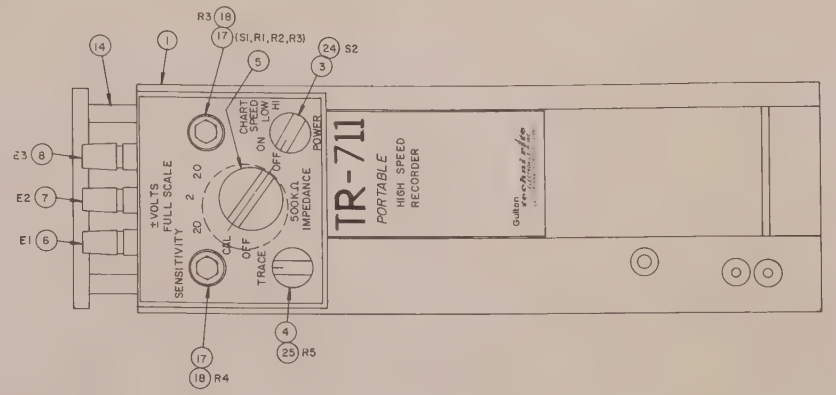
Gulton techni-rite® ELECTRONICS INCORPORATED

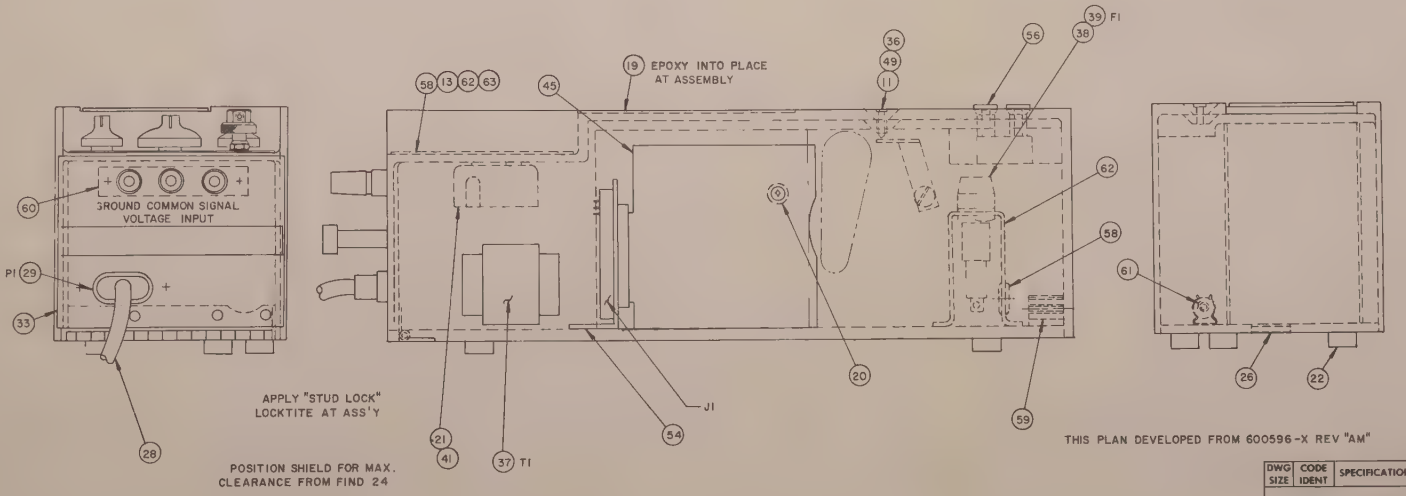
SCHEMATIC
INPUT CIRCUIT

SIZE	CODE IDENT	DWG NO.
C		401097

SCALE	CONTRACT NO.	SHEET
—//		1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED





THIS PLAN DEVELOPED FROM 600596-X REV "AM"

DWG SIZE	CODE IDENT	SPECIFICATIONS	QUAN REQ	FIND NO	PART NO OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
PARTS LIST						

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS ± 1/64 | TWO PLACE DECIMALS ± .010
ANGLES ± 1° | THREE PLACE DECIMALS ± .005
REMOVE ALL BURRS AND SHARP EDGES
DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING .63 MACHINE SURFACES TO BE \ RMS
MATERIAL

DRAWN BY: S D LAVOIE DATE 26 OCT 71
CHECKED BY:
CONTRACTOR CERTIFICATION:
DESIGN APPROVAL:
DOCUMENTATION APPROVAL:

Gulton technirite INCORPORATED ELECTRONICS

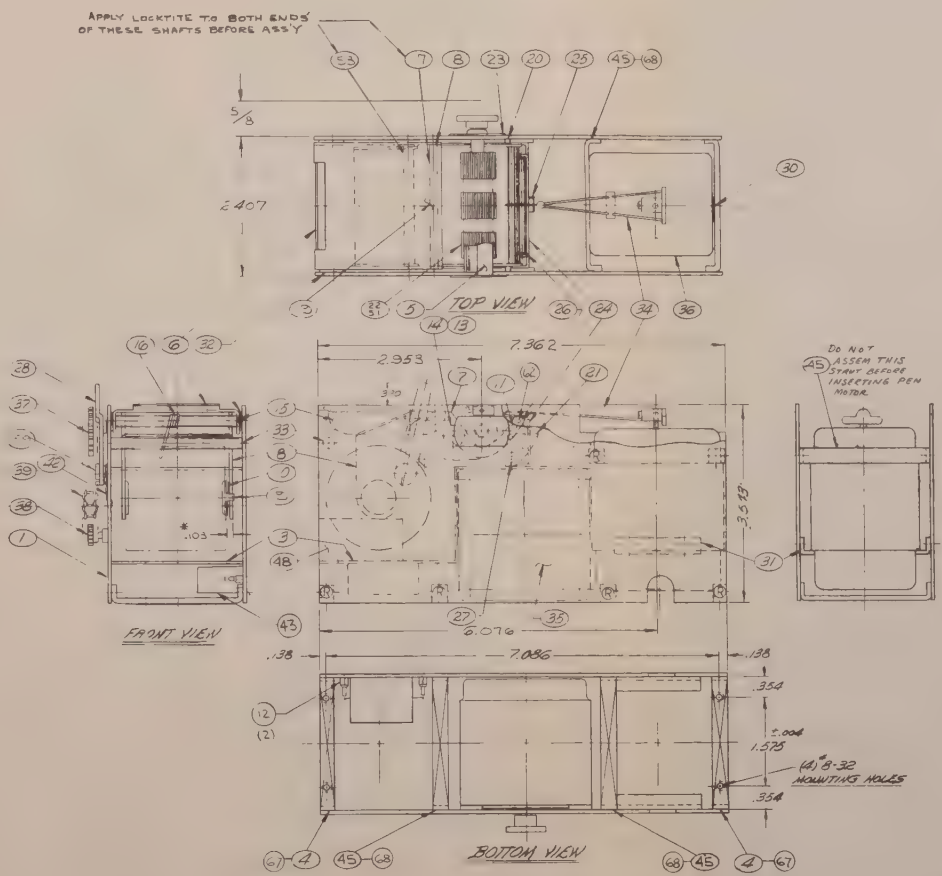
ASSEMBLY
SINGLE CHANNEL RECORDER

SIZE	CODE IDENT	DWG NO.
D		600780

SCALE	CONTRACT NO.	SHEET
1/1		1 OF 1

DWG SIZE	NEXT ASSY	USED ON
	TR-711	
	APPLICATION	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET ONE FOR REVISIONS		



DWG SIZE	CODE IDENT	SPECIFICATIONS	QUAN REQ	FIND NO.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
		PARTS LIST				

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS ± 1/64 | TWO PLACE DECIMALS ± .010
ANGLES ± 1° | THREE PLACE DECIMALS ± .005
REMOVE ALL BURRS AND SHARP EDGES
DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING. 63 MACHINE SURFACES TO BE √ RMS.
MATERIAL
SEE SHT 2 OF 2

DRAWN BY: R.W. UPTON 7 OCT 69
CHECKED BY: H.L. MAGUIRE 14 OCT 69
CONTRACTOR CERTIFICATION:
DESIGN APPROVAL:
DOCUMENTATION APPROVAL:

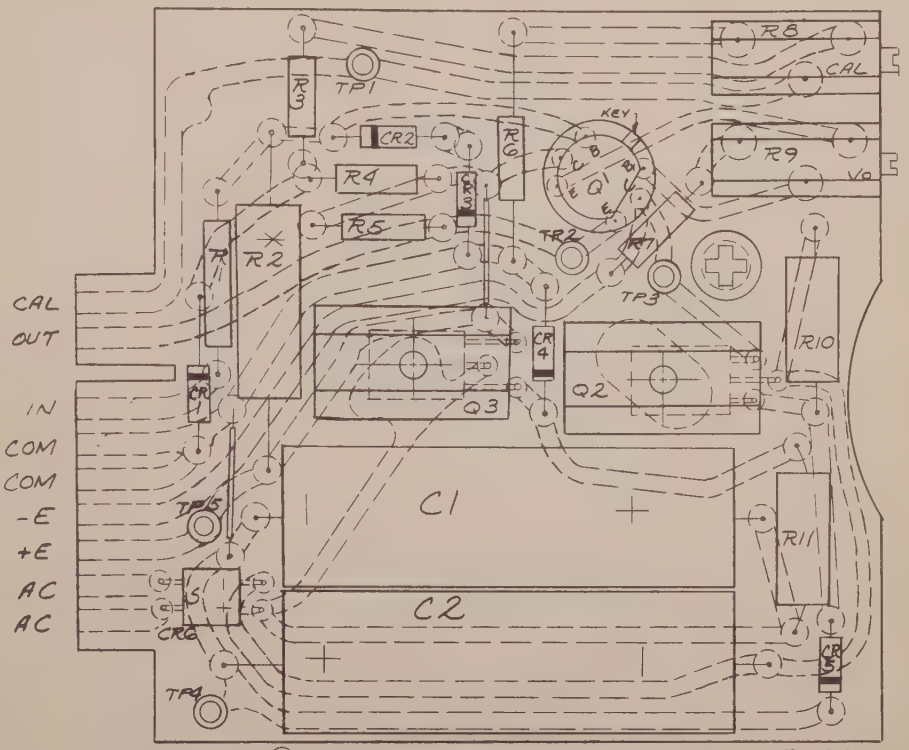
Gulton technimite ELECTRONICS INCORPORATED

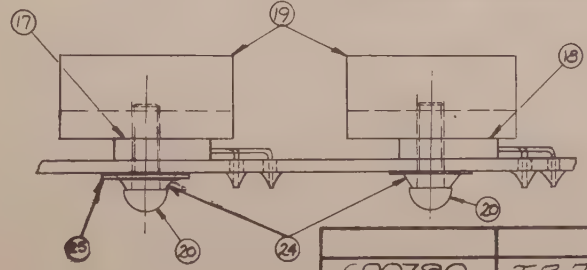
ASSEMBLY
RECORDER

SIZE D | CODE IDENT | DWG NO. 600535-X
SCALE 1:1 | CONTRACT NO. | SHEET 2 OF 2

DWG SIZE	NEXT ASSY	USED ON
	600535	TM12-20
	APPLICATION	

ZONE	SYM	DESCRIPTION	DATE	APPROVED
	E	REDRAWN	10-3-69	
	F	FIND #14 WAS 103533	29 DEC 69	20701
	G	FIND NO. 19 WAS 104613 Mfg	18 MAR 70	20351
	H	ADDED FIND # 25 P.A.L.	29 APR 70	21302





MOUNTING PROCEDURE FOR POWER TRANSISTORS. USE SILICONE GREASE BETWEEN POWER TRANSISTOR AND HEAT SINK

*R2 SHALL BE SELECTED AT TEST TO REDUCE EXCESSIVE JO SHIFT (SEE 401097 SCHEM)

FIND	NAME	SYM.	PART NO.	QTY.
25	WASHER, NYLON		104706	1
24	CUP WASHER (SUPPLIED WITH POWER TRANSISTOR)	—	——	2
23	SPACER, TRANSISTOR	—	104305	1
22	SCHEMATIC	—	401097	X
21	PC BOARD	PC1	104793	1
20	#4-40 BHMS SS 3/8 LG.	X	——	2
19	HEAT SINK	X	104613-1	2
18	TRANSISTOR PNP	Q2	103846	1
17	↓ NPN	Q3	103833	1
16	TRANSISTOR DUAL	Q1	104468	1
15	DIODE ZENER 16V	CR5,4	101968-16	2
14	RECTIFIER BRIDGE	CR6	106080-2	1
13	DIODE ZENER 9V REF	CR1	104154	1
12	DIODE ZENER 7.5V	CR3 CR2	104679	2
11	CAPACITOR 530UF 25V	C1,C2	104131	2
10	RESISTOR 180Ω 1W CC	R10,11	100558-181R	2
9				
8	POT 500Ω	R8	103954-501	1
7	RESISTOR 1K ½W MF	R6	100549-1001	1
6	RESISTOR 51.1K	R3	100549-5112	1
5	RESISTOR 698Ω	R4	100549-698R	1
4	RESISTOR 49.9K	R5	100549-4992	1
3	RESISTOR 1M	R7	100549-1004	1
2	POT 20K	R9	103954-203	1
1	RESISTOR 100K ½W MF	R1	100550-1003	1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES:
TOLERANCES ON:
FRACTIONS ± 1/64 | DECIMALS ± .005 | ANGLES ± 1°
REMOVE ALL BURRS AND SHARP EDGES. DIMENSIONS AND TOLERANCES SHALL BE HELD AFTER PLATING.
MATERIAL:

DRAWN BY: 30CT69 R.W. UPTON
CHECKED BY: 6 OCT 69 J.F. CAYER
CONTRACTOR APPROVAL:
DESIGN APPROVAL:
DOCUMENTATION APPROVAL:

NEXT ASSEMBLY	USED ON
600780	TR 711
	TR 722
APPLICATION	

Guiton techni-rite® ELECTRONICS INCORPORATED

ASSEMBLY, BUFFER AMP AND POWER SUPPLY

SIZE B | CODE IDENT NO. | DWG. NO. 201123
SCALE: 2:1 | CONTRACT NO. | SHEET 1 OF 1

IX. ACCESSORIES

TAC-45	Leather Carrying Case
TAC-46	Inverter for 12 VDC Operation
TAC-58	Left Hand Event Marker (Switch Closure)
TAC-59	Right Hand Event Marker (Switch Closure)
TAC-70	Chart Rewinder
TAC-135	Remote Control Chart Drive

www.manualsplus.com

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Gulton

techni-rite

ELECTRONICS, INC.

Route 2, East Greenwich, R.I. 02818

Tel: (401) 884-6800 • TWX: 710-387-1500